Introduction to preventive technologies

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Special Section

ASSESSMENT OF PREVENTIVE TECHNOLOGIES

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Medical technologies usually are associated with diagnostic or therapeutic devices or procedures. The association tends toward the "high-tech" side of the developmental spectrum and emphasizes the recent transfer of experimental techniques to the bedside. Preventive health care technologies are usually not considered to be in the mainstream of technology assessment. This may in part be because, despite the academic acceptance of the U.S. Office of Technology Assessment's definition of health care technology as the "drugs, devices, and medical and surgical procedures used in medical care, and the organizational and supportive systems within which such care is provided," the more general use of technology tends to connote a mechanical or electrical piece of equipment. Another factor that may emphasize the assessment of diagnostic and curative technologies over preventive ones is the linkage of technology assessment with reimbursement for medical expenses, health care cost containment, and quality control. These issues are central to clinical technologies but remain tangential to most preventive technologies.

This state of affairs can be illustrated by a cursory review of subjects in the issues of the last 3 years of this journal. Of over 90 articles, 2 could be considered as dealing with a preventive technology. We seek to fill in some of this gap with this issue, in which we focus exclusively on preventive technologies. We hope to demonstrate for the reader that (a) these are vitally important aspects of our efforts to improve health; (b) these preventive technologies not only merit assessment, they require it; and (c) the methodologies for, and issues of, technology assessment have several key differences for preventive versus clinical subjects.

The range of preventive technologies is broad and can be classified along a continuum of degree of "preventability." At one end is our ability to actually prevent an adverse health event from occurring (primary prevention). If we cannot prevent illness, we then aim at its early detection (secondary prevention), with the understanding that detection at a pathological process's earliest stages is more likely to lead to cure or reversal of the process. Finally, when we either do not have the tools for early detection or such detection does not alter the course of illness, we can take steps to prevent the complications of disease (tertiary prevention).

When carried to an extreme, such as the use of heroic measures in an intensive care unit to "prevent" death, the use of "prevention" is disingenuous. The preventive medicine purist is most comfortable with primary prevention activities, but will em-

brace some secondary prevention activities (such as screening) if the outcomes seem substantial. One factor that seems to make technologies of tertiary prevention more acceptable is if they permit an individual to avoid an increased degree of disability. For example, we do not have the knowledge or tools for preventing juvenile-onset (insulin-dependent) diabetes. Likewise, we have no data that prove that early detection and management affects this disease's outcomes. But we do know that proper management by both patient and health care provider, while a patient is still fully or mostly functional, will avert or appreciably delay sequelae such as lower extremity amputation and visual impairment.

The articles comprising this issue present assessments of a variety of preventive technologies. For the category of primary prevention, which may be thought of as synonymous with health promotion, we have chosen to look at two broad-based approaches. The first, school health education, deals with a multiplicity of risk factors for many diseases and hazards. Provided to young people during the crucial period of their physical and intellectual growth, this prevention technology, potentially one of the most powerful, conveys knowledge of bodily functions and of their relationship to healthy and unhealthy behaviors. During this period, a young person's health can be profoundly influenced by decisions involving such lifestyle-forming behaviors as eating habits; physical activity; and use of tobacco, alcohol, and other addictive substances. The knowledge provided through school health education, along with techniques designed to encourage positive health attitudes and behaviors, has been shown to be effective in a number of studies using different curricula. Dwyer et al. review the progress and effectiveness of school health education programs.

Another broad primary prevention approach involves community interventions. For over two decades around the world, many of these community-based efforts have focused on cardiovascular disease and the several risk factors for coronary heart disease that have been documented. Vartiainen et al. review population-based programs designed to alter blood cholesterol and lipoproteins.

The annual U.S. Public Health Service Surgeon General's Report on Smoking provides a useful background document for assessment of smoking prevention and control strategies, and there is a growing literature on behavioral, epidemiologic, economic, legal, social, and other aspects of smoking. For this issue, Mackay and Davis assess community approaches to reducing smoking in populations.

Immunization is a primary preventive technology that has received considerable assessment. For this issue, Steffen et al. focus on a particular use of immunizations in the setting of relief and refugee missions. Hatziandreu et al. examine the cost-effectiveness of hepatitis-B vaccination in Greece. This article provides an example of a cost assessment of a relatively new vaccine and explores the issue of how disease prevalence contributes to technology assessment and, consequently, to decision making.

One of the great triumphs of modern preventive medicine, and indeed of medicine in general, has been the dramatic decline in dental caries through the fluoridation of water. In this issue, Corbin evaluates fluoridation and other oral disease preventive technologies used on a community basis.

There are many opportunities for preventive approaches in environmental and occupational health. Actions that can prevent disease and hazards include altering industrial design, enacting laws, using safety equipment, and teaching workers safe practices. The study of motor vehicle collisions, a particular environmental hazard, provides a rich example of the wide assortment of preventive technologies that can contribute to the control of this problem. For this issue, Chorba systematically assesses technolo-

gies developed and designed to prevent motor vehicle collisions or to reduce death and injury when collisions occur.

Early detection of disease using a variety of screening tools is a widespread form of primary and secondary prevention. The screening may be targeted to risk factors (blood tests for cholesterol, community blood pressure measurement for hypertension), to early stages of disease (mammography for breast cancer, Pap smears for cervical dysplasia and carcinoma in situ), or to congenital abnormalities (amniocentesis for specific birth defects, school-based screening for scoliosis). In this issue, Rosenbrock considers screening for HIV infection and offers a controversial view of this practice. La Vecchia et al. review the effectiveness of screening for various types of cancer.

This issue does not attempt to provide an exhaustive review of preventive technology. Many important disease prevention and health promotion technologies are not reviewed here, such as dietary interventions, exercise programs, prenatal screening, and multiphasic chemistry screening. Those that are presented, however, provide rich illustrations of the varieties and importance of preventive technologies and their need for assessment.